Claims

1. Device for variable actuation of gas exchange valves of internal combustion engines in which one or more cams (2) of a camshaft (1) mounted in a housing rotate as a function of the engine speed, cam (2) first drives a connecting link (4), which executes an oscillating, pure rotational motion whose axis of rotation (7) in the housing can be displaced parallel to itself along an adjustment curve (8) and which has a radial cam (5) with a rest area (5a) and a lift area (5b), and, through this radial cam (5), actuates a driven element (11) which in turn actuates at least one valve (13), **characterized in** that the connecting link (4) is mounted on a bearing with an axis corresponding to the axis of rotation (7), [that] this bearing is restricted to and can be displaced in parallel on the adjustment curve (8, 28, 35) through a joint (16, 24, 26) connected with the cylinder head or the housing or a slide (34) that is guided in the housing in a positive-fit manner.

2. Device of claim 1, **characterized in** that the connecting link (4) is mounted on a bolt (6) whose axis (7) is the axis of rotation of the connecting link (4).

3. Device of claims 1 or 2, **characterized in** that the bolt (6) is connected with the housing by pendulum supports (15) and its axis (7) is guided on an arc-shaped adjustment curve (8).

4. Device of claims 1 or 2, **characterized in** that the bolt (6) is connected with the housing by four-bar linkages (24, 25, 26, 27) and its axis (7) is guided on an approximately arc-shaped adjustment curve (28).

5. Device of claims 1 or 2, **characterized in** that the bolt (6) is connected with the housing by slide (34) guided in the housing in a positive-fit manner and its axis (7) is guided on a straight line (35).

6. Device of one or more of claims 3 or 5, **characterized in** that the

driven element (11) has a hydraulic play compensation element (31) arranged on it.

7. Device of one or more of claims 1 through 6, **characterized in** that the position of the bolt (6) or its axis (7) is adjusted directly or indirectly on the adjustment curve (8, 28, 35) by means of at least one cam disk (18) or a cam, and the bolt (6) or its axis (7) is supported along the adjustment curve (8, 28, 35) in an essentially tangential direction with respect to the housing.

8. Device of one or more of claims 1 through 6, **characterized in** that a hydraulic unit directly or indirectly specifies the position of the bolt (6) or its axis (7) on the adjustment curve (8, 28, 35) that is required in every case and supports it along the adjustment curve (8, 28, 35) in the tangential direction against the housing.

9. Device of one or more of claims 1 through 7, **characterized in** that the cam disks (18) to be rotated are arranged on an adjusting shaft (17), which is adjusted through an adjusting motor (23) and, if necessary, a transmission.

10. Device of one or more of claims 1, 2 or 5 through 9, **characterized by** an adjusting motor (23) and a threaded spindle (36) which brings the slide (34) into the position desired in every case.

11. Internal combustion engine comprising several of the devices of one or more of claims 1 through 10, in which one of the devices is separately assigned to each engine valve.

12. Internal combustion engine comprising at least one device of one or more of claims 1 through 10, in which each two adjacent, parallel valves of a cylinder have a device separately assigned to them.

13. Device of claim 12, **characterized by** a common connecting link (4)

with two different radial cams for the two valves.

14. Device of claim 12, **characterized by** two different cams (2) and two connecting links (4) with different radial cams for the two valves.

15. Device of one or more of claims 1 through 14, **characterized in** that the transmission elements are designed so that there is at least one adjustment position for the displaceable connecting link (4) in which at least one valve (13) remains closed during the rotation of the cams (2).

16. Device of one or more of claims 1 through 10, **characterized by** the common, combined actuation of the valves of several cylinders and a common, continuous bolt (6) for all connecting links (4) of these valves.

17. Device of one or more of claims 1 through 10 or 16, **characterized in** that the bolt (6) can rotate freely on the side of its guidance, that it carries one or more cam disks (18) that are connected in a torsionally rigid manner, and that it can be rotated, through a suitable connection element, by an adjusting motor (23), and that the cam disks (18) are supported with respect to the housing.

18. Device of claim 17, **characterized in** that the cam disks (18) are supported on sliding blocks (21) made of a material of increased hardness which are provided in the housing.

19. Internal combustion engine comprising several of the devices of one or more of claims 1 through 9 or 16 through 18, **characterized by** a common adjusting shaft (17), which has at least one cam disk (18) per device and the cam disk (18) for at least one device has a section in which this device does not change its position when the adjusting shaft (17) is twisted and the cam disk (18) for at least one other device causes a change in the position of this other device during this twisting of the adjusting shaft (17).

20. Internal combustion engine comprising several of the devices of one or more of claims 1 through 9 or 16 through 18, **characterized by** a common adjusting shaft (17), which has at least one cam per device and the cam contour for at lease one device has a section in which this device does not change its position when the adjusting shaft (17) is displaced and the cam contour for at least one other device causes a change in the position of this other device during this displacement of the adjusting shaft (17).

21. Process for operating an internal combustion engine with several cylinders using one or more devices of one or more of claims 1 through 20, **characterized in** that after a desired load state for the entire engine is reached

a) angular position signals of the crankshaft are picked up with a first rotational angle sensor (42) on the flywheel and evaluated by an engine management system (44) in order to detect rotational irregularities of the crankshaft and/or torque peaks;

b) these are assigned to the individual cylinders with the help of a second rotational angle sensor (43) arranged on the camshaft or on another shaft running at half the crankshaft speed; and

c) this information is used to produce signals which go to individual drives to even out the torque peaks and/or the crankshaft speed, by correcting the valve strokes of the cylinders with the smaller torques upward and correcting those of the cylinders with the larger torques downward.

22. Process for operating an internal combustion engine with several cylinders using one or more devices of one or more of claims 1 through 20, **characterized in** that

a) each cylinder has assigned to it a separate device and a drive to actuate the device;

b) the phase position of the rest phases of the individual valves operated by a drive is determined; and

c) the adjustment movements of the individual devices take place during the common rest phases of the valves operated by the respective drive.

23. Process of claim 23, **characterized in** that the phase position of the rest phases of the individual valves operated by a drive is determined by an engine management system (44) from the signal of a rotational angle sensor (43) arranged on the camshaft.